# Electric Vehicle 101 Workshop

December 4, 2019

# Workshop Overview

Xcel Energy®
PARTNERS IN ENERGY
An Xcel Energy Community Collaboration

## Objectives

Learn about tips, costs, and benefits of electric vehicles, electric rates, and Colorado's EV plan

## Agenda

- 7:00 – 7:10 Welcome & Overview (Shelby, Partners in Energy)
- 7:10 – 7:30 State of EVs in CO (Zach, CO Energy Office)
- 7:30 – 8:00 EV Basics (Tim, CSU Extension)
- 8:00 – 8:20 Xcel Energy's EV Options (Stacy, Xcel Energy)
- 8:20 – 8:30 Questions & Exit Survey



Centennial

# Energy Action Plan

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## Vision

*The City of Centennial will create a resilient future for its residents and businesses through improved energy efficiency, enhanced connectivity, education, and cost savings.*

## Goals

- Help residents **save money** through energy efficiency programs and rebates.
- Connect businesses with **free and low-cost** energy efficiency programs.
- Ensure community facilities are **running efficiently** and taking advantage of rebate opportunities.



Centennial

# Electric Vehicle 101 Workshop
# Centennial, CO

Zach Owens
Colorado Energy Office
December 4, 2019

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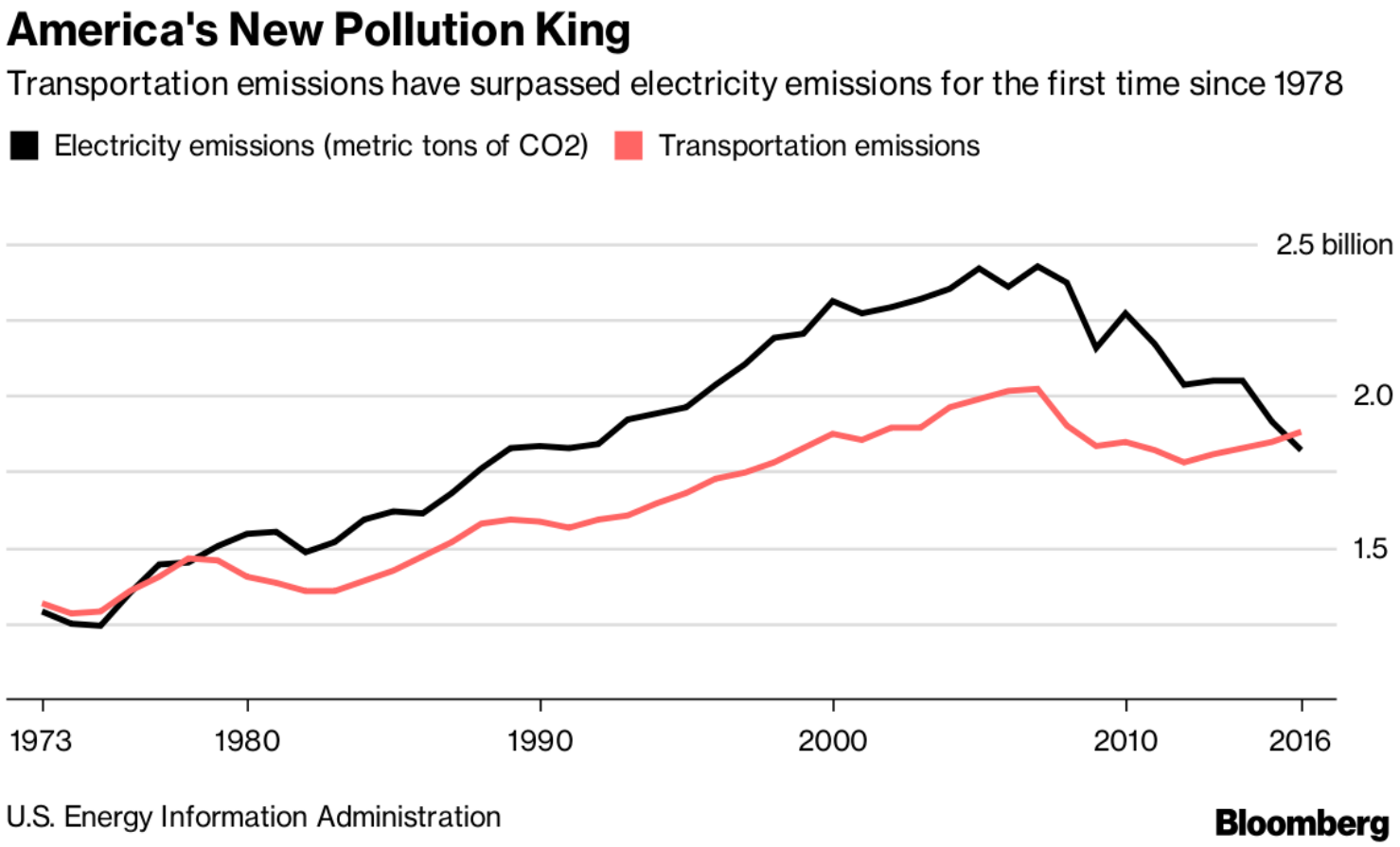
# *Vehicles are now the Largest Source of Carbon Pollution*

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# Transportation Fuels and Technology

CEO's Transportation Fuels and Technology Team works to accelerate adoption of alternative fuel vehicles through:

1. Program Management – administer grant programs that reduce the upfront cost of installing charging infrastructure.
2. Policy and Planning – make Colorado an attractive place to own and operate an electric vehicle (EV) and make investments in EVs and charging infrastructure.
3. Outreach and Education – provide information to consumers on the costs and benefits of owning and operating EVs.

# Barriers to Electric Vehicle Adoption

The State of Colorado focuses on 3 primary barriers to electric vehicle (EV) adoption:

1. High upfront cost (and availability/assignability of grants and other incentives).
2. Lack of publicly-accessible Level II and DC Fast-Charging infrastructure.
3. Lack of information on the costs, benefits, and availability of EVs (and infrastructure).

# Executive Order B 2019 002

## Supporting a Transition to Zero Emission Vehicles

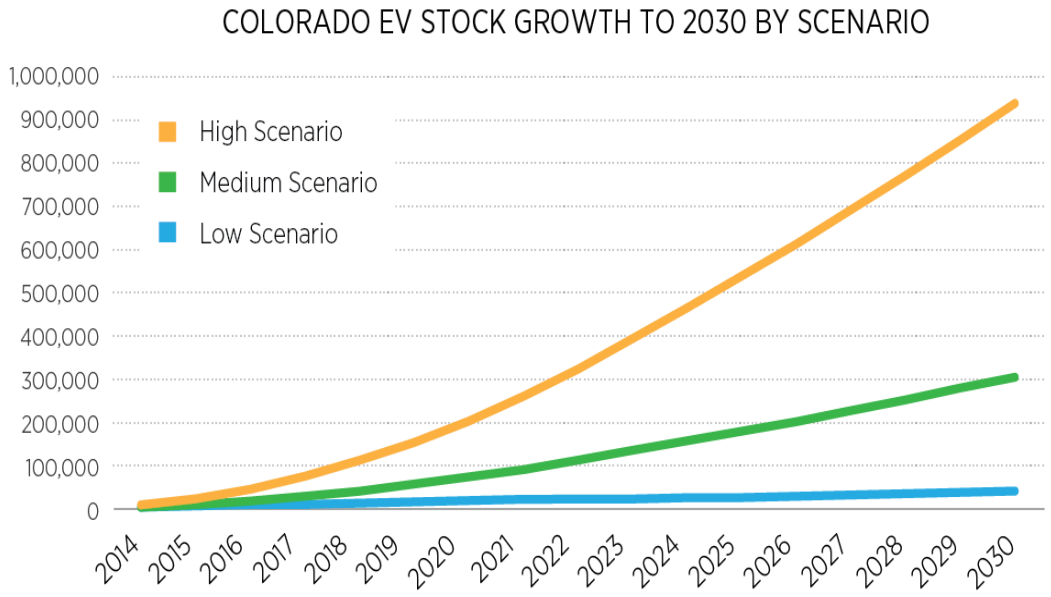
1. Creates an interdepartmental electrification workgroup to support widespread electrification across the state.

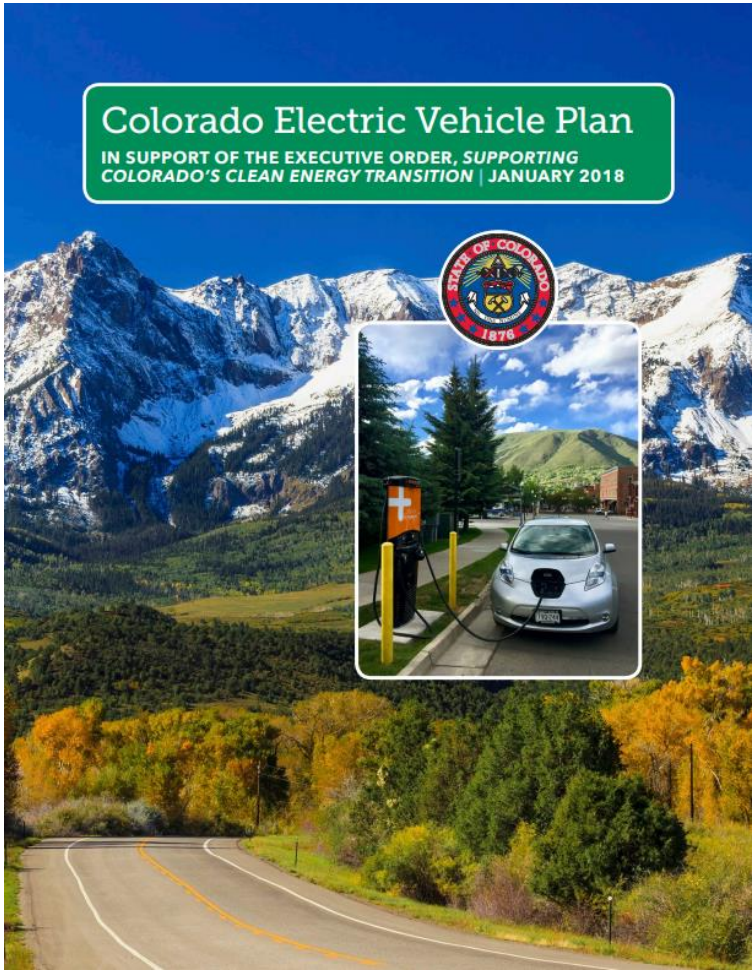
2. Directs CO Dept. of Public Health and Environment (CDPHE) to develop a rule to establish a Colorado Zero Emission Vehicle program and propose to the Air Quality Control Commission no later than May 2019 for possible adoption before October 30, 2019.

3. Directs CDPHE to revise the VW Beneficiary Mitigation Plan to focus all remaining eligible investments on supporting electrification of transit and school buses and trucks.

4. Directs CO Dept. of Transportation to develop a zero emission vehicle and clean transportation plan.

# Colorado Electric Vehicle Plan

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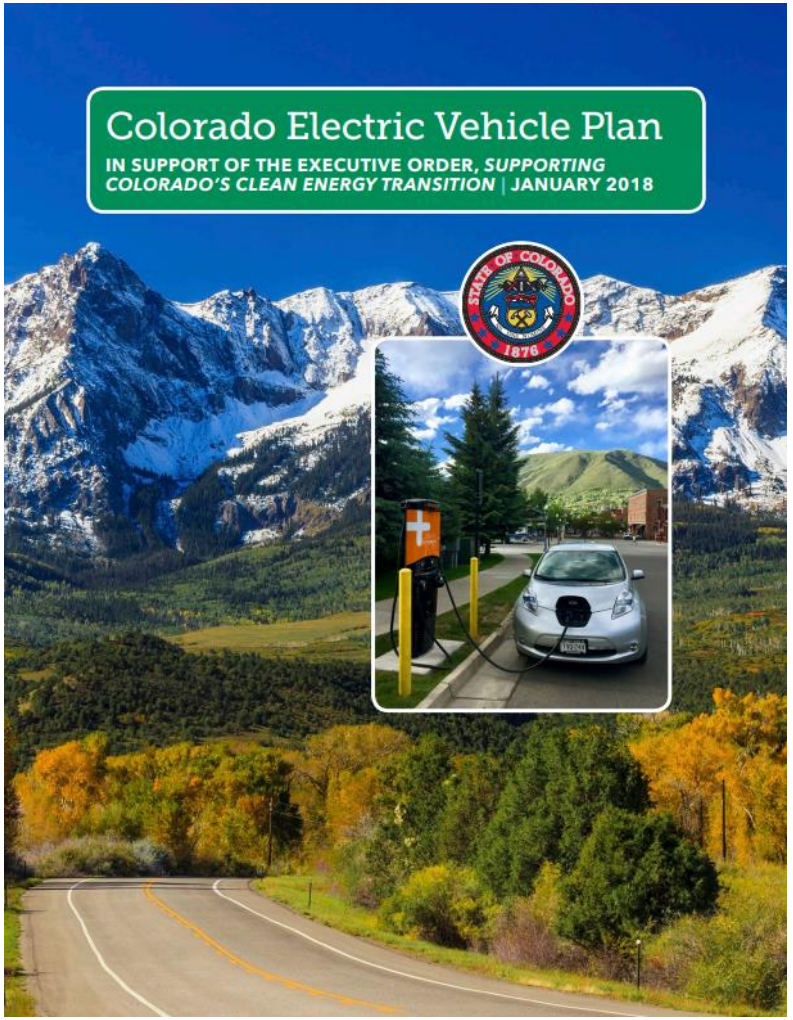
# Colorado Electric Vehicle Plan

- Build out key charging corridors that facilitate economic development, boost tourism, and reduce harmful air pollution.
- Accelerate adoption of EVs and ensure Colorado remains a leader in the EV market.
- Currently updating the plan – anticipated release January 2020.

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# 2019 Legislative Session

- House Bill 19-1198 – Powers and Duties of the EV Grant Fund
- House Bill 19-1159 – Modifications to the Income Tax Credits for Innovative Motor Vehicles
- Senate Bill 19-077 – Public Utility Implementation of an EV Infrastructure Program
- Senate Bill 19-239 – Addressing Impacts of Changes Related to Commercial Vehicles
- House Bill 19-1298 - Electric Motor Vehicle Charging Station Parking

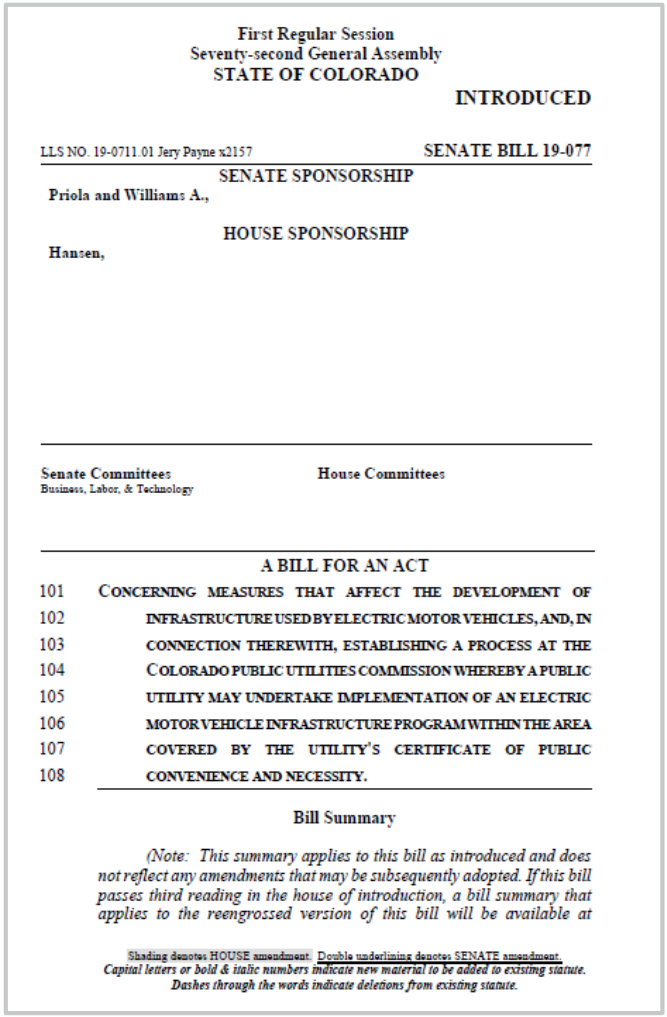
# House Bill 1159 – EV Tax Credit Extension

- Modifies the amounts of and extends the number of years of the existing income tax credits for the purchase or lease of an electric or fuel cell vehicle.
- Ratchets down the value of the tax credit starting in 2020 and phases it out at the end of 2025.
- Allows TNCs to claim full tax credit if vehicles are provided to drivers under short-term rental programs.

| Year | Plug-in Electric, Electric Passenger, Fuel Cell Vehicles | Light Duty Electric, Fuel Cell Trucks | Medium Duty Electric, Fuel Cell | Heavy Duty Electric, Fuel Cell Trucks |
|---|---|---|---|---|
| 2019 | $5,000 | $7,000 | $10,000 | $20,00 |
| 2020 | $4,000 | $5,500 | $8,000 | $16,000 |
| 2021 - 2022 | $2,500 | $3,500 | $5,000 | $10,000 |
| 2023 - 2025 | $2,000 | $2,800 | $4,000 | $8,000 |

# Senate Bill SB 077 - Utility Ownership

- Authorizes public utilities to provide charging stations as regulated or unregulated services
- Allows a public utility to apply or PUC to request an application to create EV program that includes investments or incentives, rates or programs, and outreach and education
- Requires public utilities to file an application for a program for regulated activities to support transportation electrification every 3 years starting in May 2020



First Regular Session
Seventy-second General Assembly
STATE OF COLORADO

INTRODUCED

LLS NO. 19-0711.01 Jery Payne x2157 SENATE BILL 19-077

SENATE SPONSORSHIP

Priola and Williams A.,

HOUSE SPONSORSHIP

Hansen,

Senate Committees
Business, Labor, & Technology

House Committees

A BILL FOR AN ACT

CONCERNING MEASURES THAT AFFECT THE DEVELOPMENT OF INFRASTRUCTURE USED BY ELECTRIC MOTOR VEHICLES, AND, IN CONNECTION THEREWITH, ESTABLISHING A PROCESS AT THE COLORADO PUBLIC UTILITIES COMMISSION WHEREBY A PUBLIC UTILITY MAY UNDERTAKE IMPLEMENTATION OF AN ELECTRIC MOTOR VEHICLE INFRASTRUCTURE PROGRAM WITHIN THE AREA COVERED BY THE UTILITY'S CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY.

Bill Summary

*(Note: This summary applies to this bill as introduced and does not reflect any amendments that may be subsequently adopted. If this bill passes third reading in the house of introduction, a bill summary that applies to the reengrossed version of this bill will be available at*

Shading denotes HOUSE amendment. Double underlining denotes SENATE amendment.
*Capital letters or bold & italic numbers indicate new material to be added to existing statute.*
*Dashes through the words indicate deletions from existing statute.*

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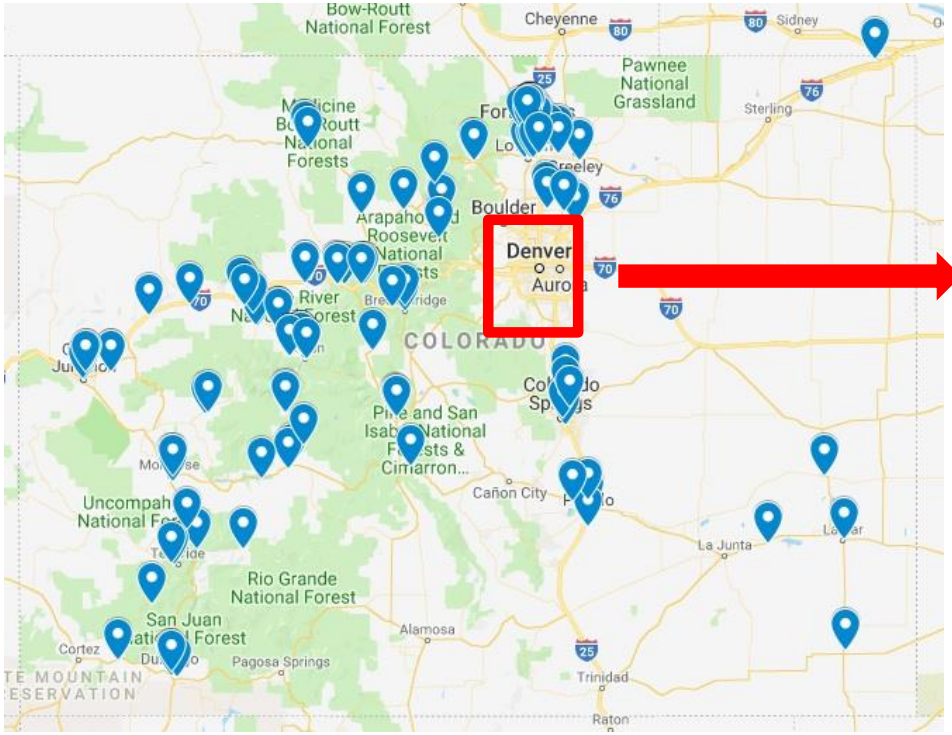
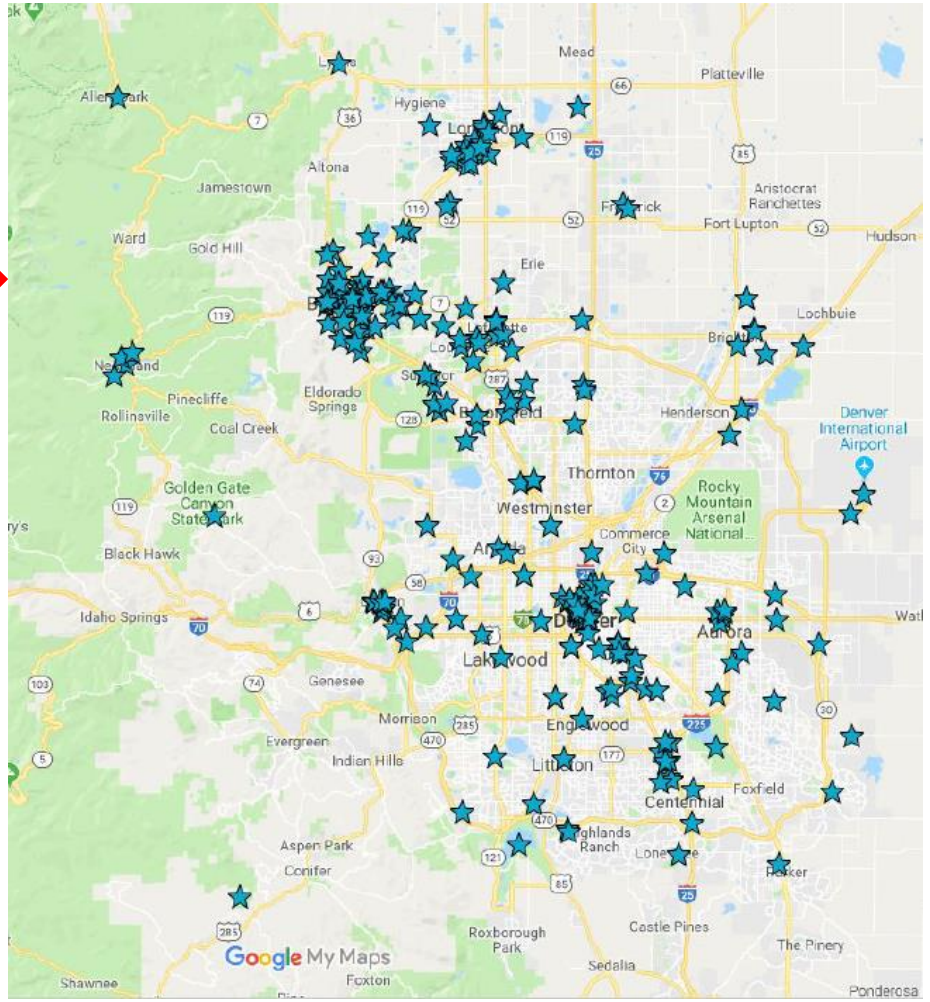
# Zero Emission Vehicle Program

- The ZEV program requires automakers to sell a certain number of EVs in California and 10 other states.
- The requirement is based on the total number of vehicles sold in the state by each automaker and range of each EV sold.
- Many electric models are made available in ZEV states before being made available in others – increases the number models available, helping to increase consumer choices.

| Option 1: 36% proportional cap, no early ZEV credits | Option 2: 23% proportional cap, early ZEV credits MY 2021-22 |
|---|---|
| • Cannot meet more than 36% of combined MY 2023-25 ZEV credit obligation using proportional credits<br>• Will not receive any early action credits for ZEVs produced and delivered for sale in Colorado prior to MY 2023 | • Cannot meet more than 23% of combined 2023-25 ZEV credit obligation using proportional credits<br>• Will receive credits for ZEV vehicles delivered for sale in Colorado in MY 2021-22, placing electric vehicles in Colorado in advance of the ZEV requirements<br>• Although the proportional credit cap is lower, requiring more ZEV sales, this path creates an incentive for automakers to deliver more ZEVs earlier and earn additional banked credits to use toward future compliance |

# Charge Ahead Colorado

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CHARGE AHEAD COLORADO

RAQC
REGIONAL AIR QUALITY COUNCIL

# Charge Ahead Colorado

- Competitive application process 3X per year
- Eligible applicants include local governments, school districts, State agencies, non-profits, apartment/condo complexes and private businesses
- Tourist Destinations are a priority! (Byways, Parks, etc.)

| Charge Ahead Colorado | | | | | | |
|---|---|---|---|---|---|---|
| | RAQC | | | CEO | | |
| Funding Source | Federal Highway Administration - CMAQ and Volkswagen settlement | | | EV Fund and Volkswagen settlement | | |
| Geographic Area | 7 County Denver Metro Area | | | Outside the 7 County Denver Metro Area | | |
| Eligible Equipment | Level 2, DC fast-chargers, Electric Vehicles | | | Level 2 and DC fast-chargers | | |
| Funding Level 80% up to: | Level 2 | DC Fast-Chargers | EV | Level 2 | DC Fast-Chargers | |
| | $9,000 | $30,000 | $8,260 | $9,000 | $30,000 | |

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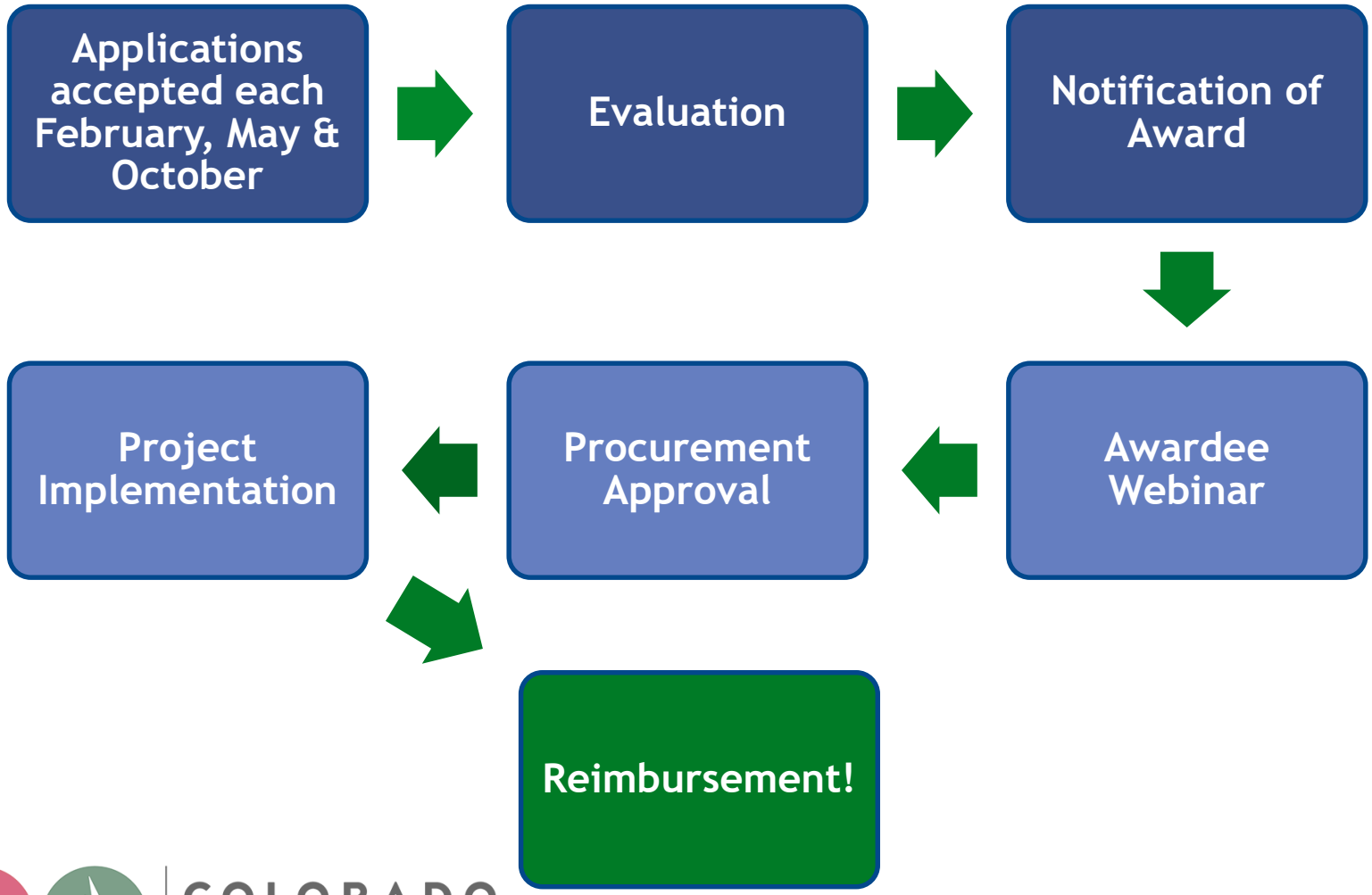
Zach Owens (CEO): zachary.owens@state.co.us or 303-866-3279

Matt Mines (RAQC): mmines@raqc.org or 303-629-5450, ext. 210

# Process Overview

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**Pueblo Library**
@pueblolibrary

Follow

Ribbon cutting for the new level 2 charging station @pueblolibrary Pueblo West Library. Thanks to our partners @SanIsabelElec @PuebloCounty @PuebloWestMetro @COEnergyOffice @natlcarcharging

2:53 PM - 19 Dec 2018

**4** Retweets **12** Likes

4 12

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# ReCharge Colorado

- EV charging experts
- Assist with Charge Ahead Colorado Applications


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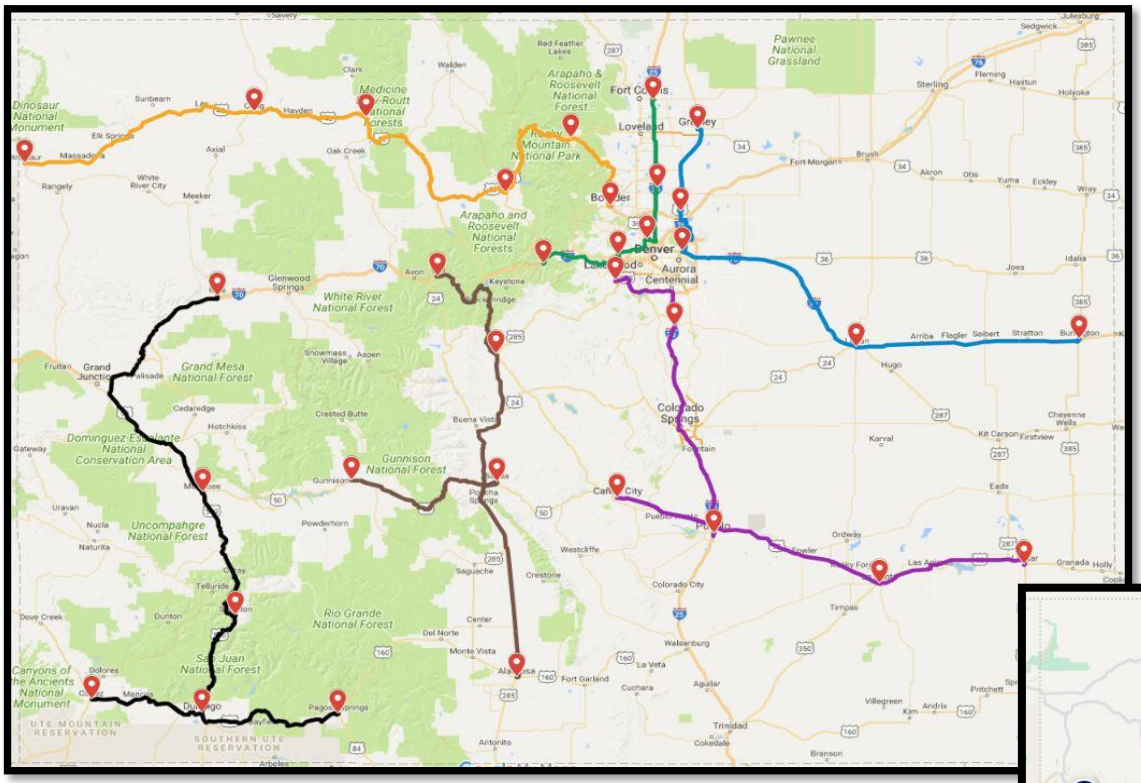
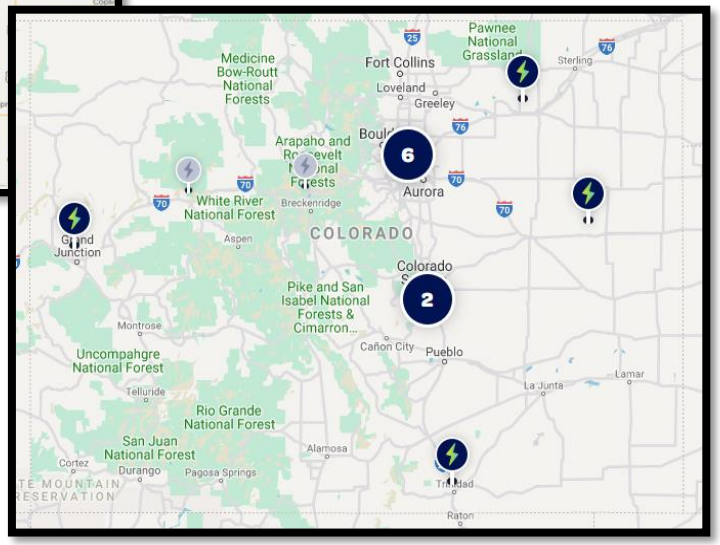
# EV Fast-Charging Corridors

## Colorado Electric Vehicle DCFC Corridor Program




## Electrify America

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# EV Fast-Charging Corridors

- $10.3 million award made to ChargePoint to build 33 DCFC across six corridors.
- 2-4 chargers at each site; capable of providing at least 50 kW and up to 156 kW charging.
- Statewide network ensures a consistent driver experience at every station.
- Committed site hosts: retail, grocery, c-store, and local governments.
- Modular technology allows for expansion.
- Currently negotiating site host agreements and submitting utility applications.
- Full build-out by June 2020.

# Questions?

Zach Owens
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Transportation Fuels and Technology
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303.866.3279

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State of Colorado
Jared Polis, Governor
1580 Logan Street, Suite 100
Denver, Colorado 80203

# Know Before You Go Electric

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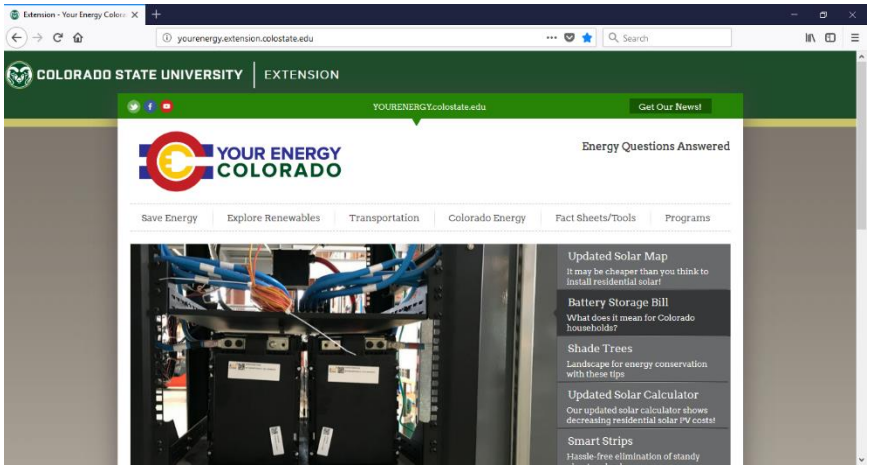
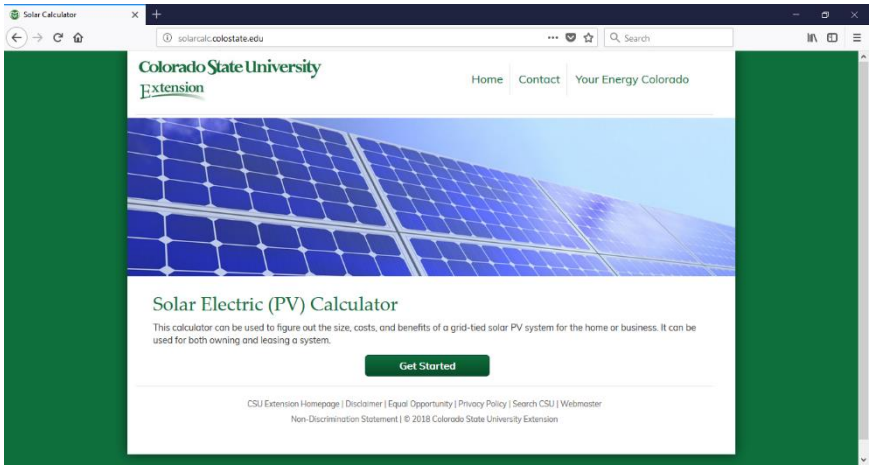
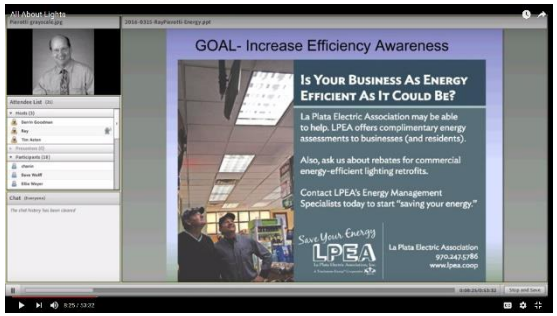
# Mission: Empowerment





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# The Plan

- EV basics
- Considerations before going electric
  - Performance
  - Costs and incentives
  - Range & charge
  - O&M
  - Environment
- Resources

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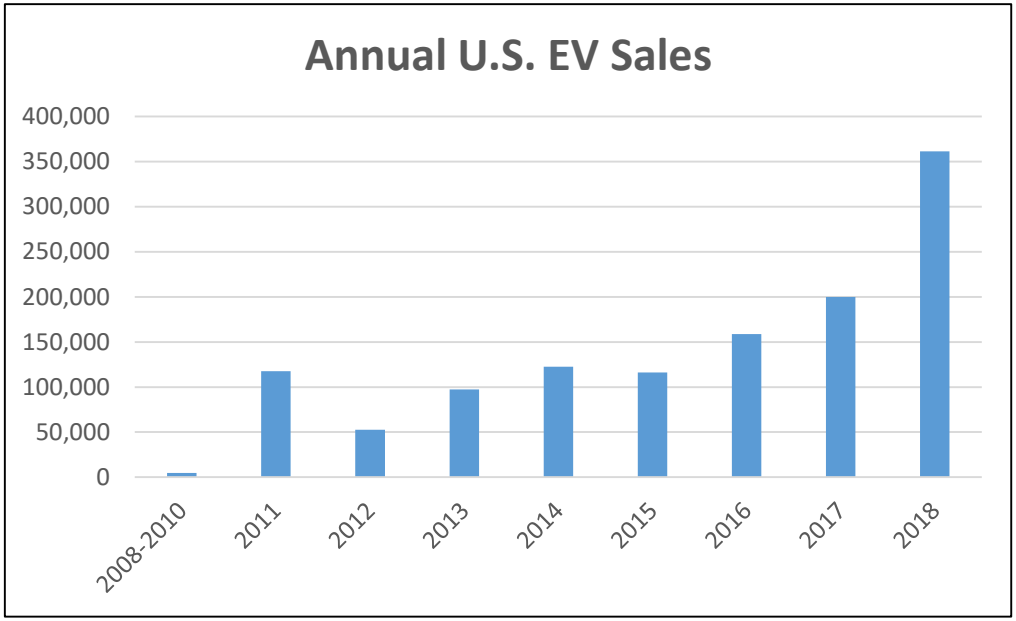
# EV Basics

Battery EV (BEV)


Plug-in Hybrid EV (PHEV)

Hybrid EV (HEV)

# EV Sales Trends




2% of CO sales
10% of CA sales
50% of Norway sales

## 2019 US Sales thru June

| | |
|---|---|
| Tesla Model 3 | 67,650 |
| Tesla Model X | 9,000 |
| Chevrolet Bolt | 8,281 |
| Tesla Model S | 7,225 |
| Nissan Leaf | 6,008 |
| BMW i3 | 2,207 |
| Volkswagen e-Golf | 1,893 |
| Audi e-tron | 1,835 |
| Jaguar I-Pace | 1,309 |
| Smart EQ fortwo | 496 |

Source: https://www.businessinsider.com/best-selling-electric-vehicles-united-states-so-far-2019-2019-7#10-smart-eq-fortwo-1

greentechmedia.com

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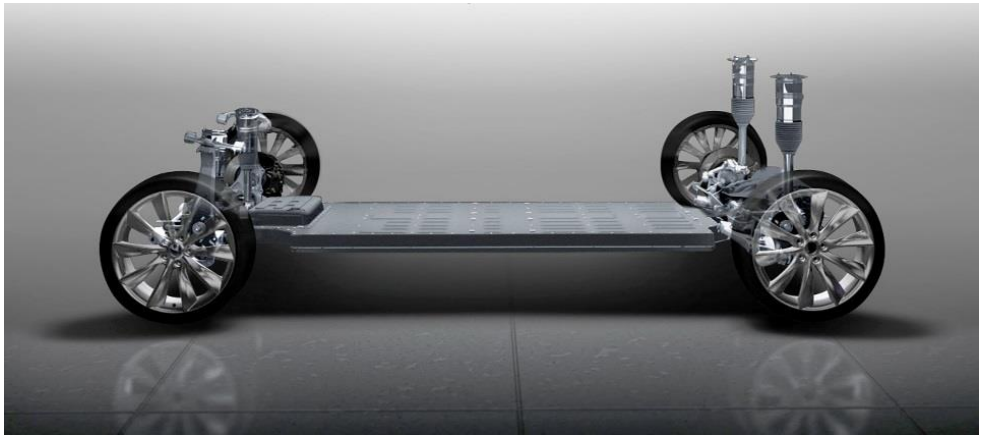
# EV Performance



- Instant peak torque
- No pauses to shift gears
- Reduced brake fade (all regenerative brakes)
- “Native” EVs with battery pack at bottom:
  - Rigidity
  - Hard to rollover
  - Better handling
- Low noise
- Limited AWD/non-sedan options

https://evannex.com/blogs/news/electric-cars-superior-performance-explained

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# AWD Options







## Minivan


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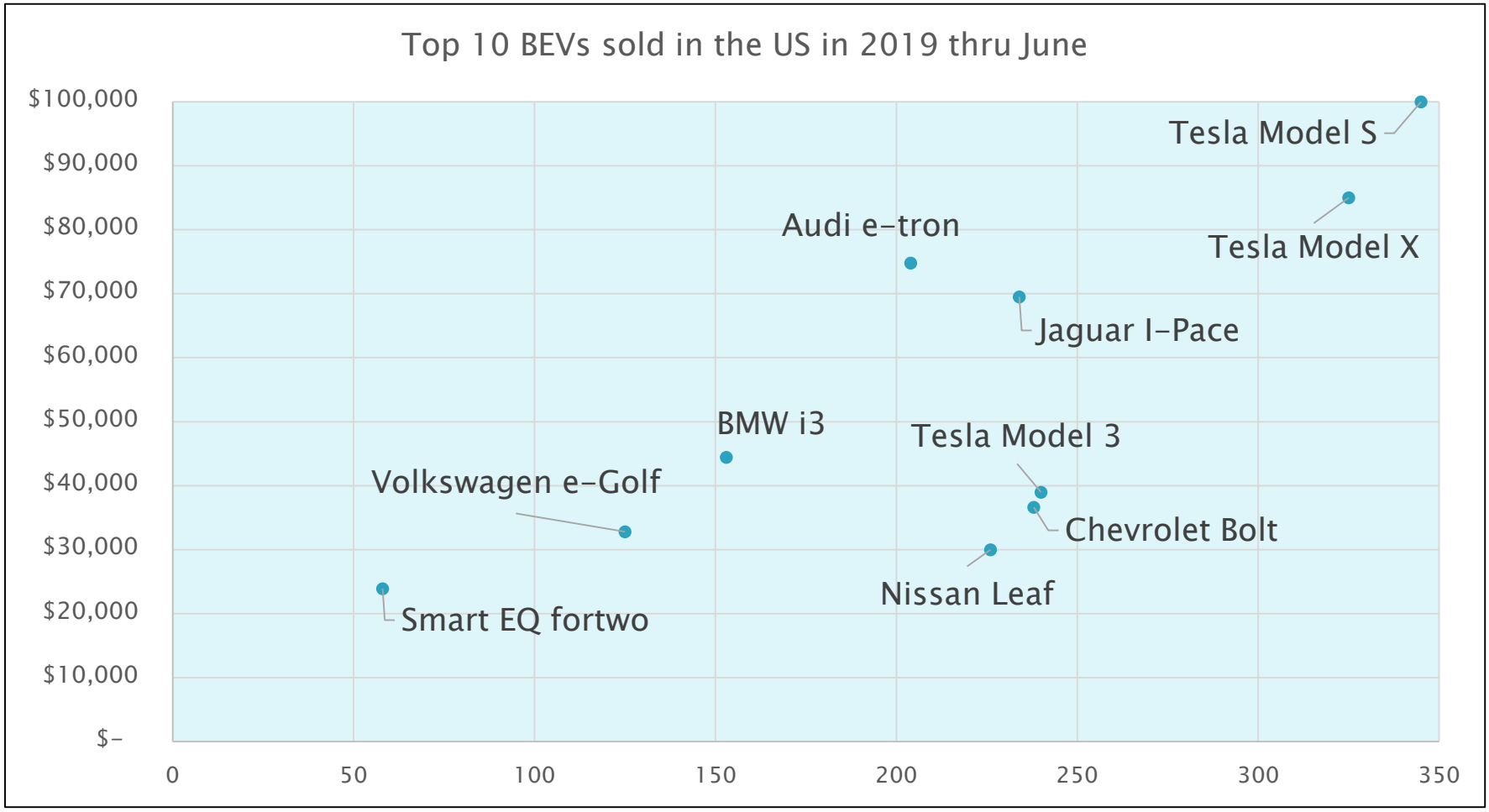
# BEV Range and Price

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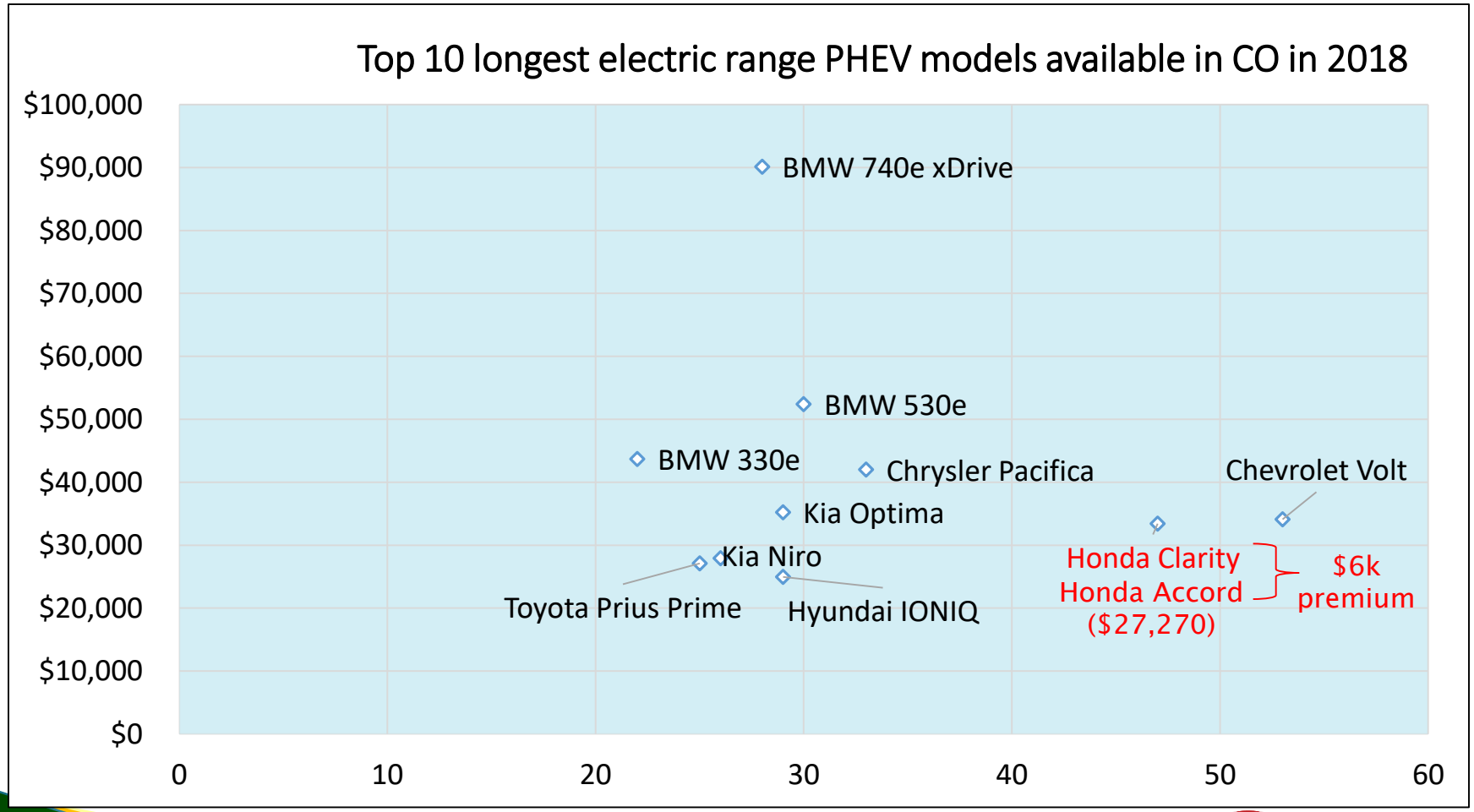
# PHEV Range and Base Price

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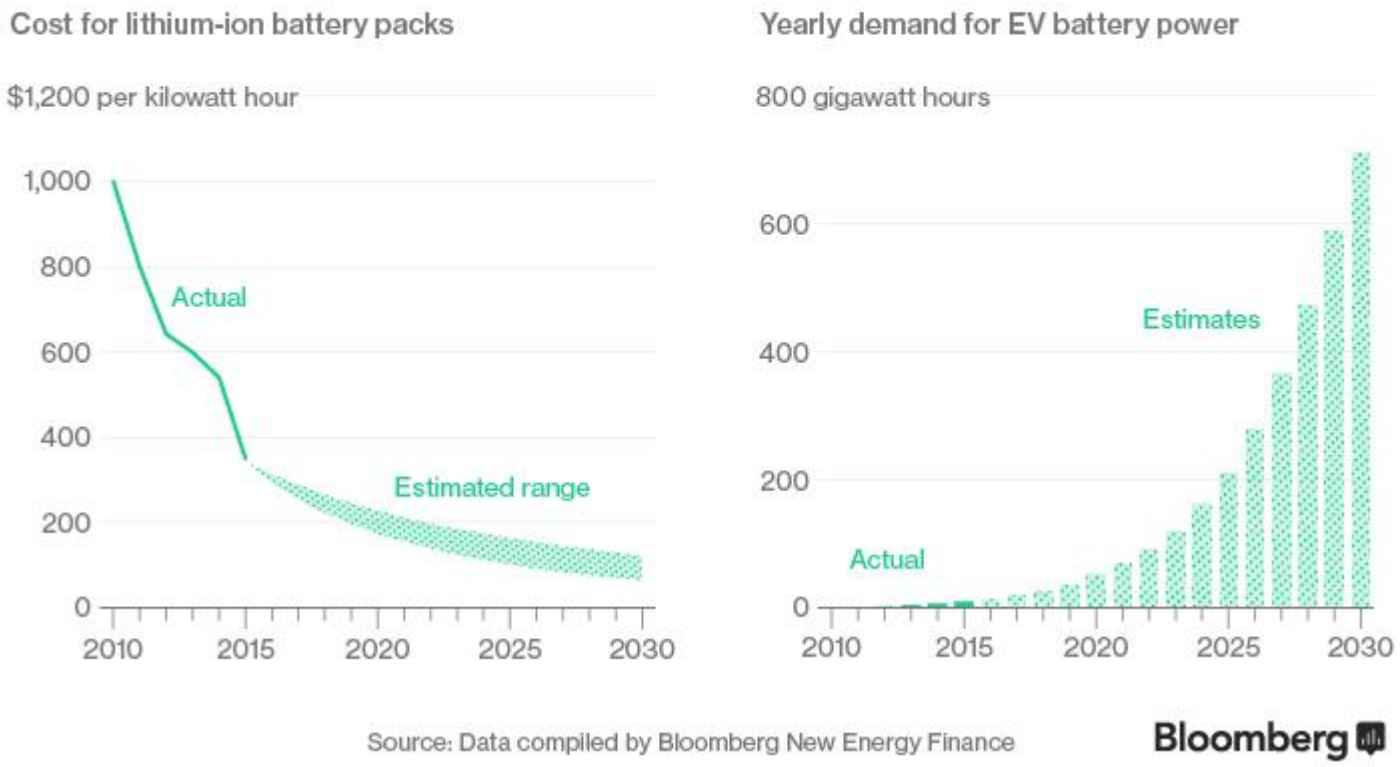
# It's All About the Batteries

Batteries make up a third of the cost of an electric vehicle.
As battery costs continue to fall, demand for EVs will rise.




Source: Data compiled by Bloomberg New Energy Finance

Bloomberg

Parity with ICE in 2022-2026?

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# Incentives

- $2,500–$7,500 tax credit
- $417 battery <5 kWh
- $417 per additional kWh
- Phased out when 200,000 sold by manufacturer
- Non-refundable
- No carryover
- Lease credit may be passed on
- fueleconomy.gov/feg/taxevb.shtml

Federal

- $5k credit may be applied at purchase
- $2,500 for 2-year min. leases
- 2020: $4k/$2k
- 2021: $2,500/$1,500
- Refundable

State of Colorado

# Sample federal tax credits

| June 2019 Rank | Model | Tax credit |
|---|---|---|
| 1 | Tesla Model 3 (BEV) | $3,750 first half 2019, $1,875 second half 2019 |
| 2 | Tesla Model X (BEV) | $3,750 first half 2019, $1,875 second half 2019 |
| 3 | Chevrolet Bolt EV (BEV) | $3,750 4/1/19 to 9/30/19, $1,875 10/1/19 to 3/31/20 |
| 4 | Tesla Model S (BEV) | $3,750 first half 2019, $1,875 second half 2019 |
| 5 | Nissan Leaf (BEV) | $7,500 |
| 6 | BMW i3 (BEV/PHEV) | $7,500 |
| 7 | Volkswagen e-Golf (BEV) | $7,500 |
| 8 | Audi e-tron (BEV) | $7,500 |
| 9 | Jaguar I-Pace (BEV) | $7,500 |
| 10 | Smart EQ fortwo (BEV) | $7,500 |

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# Charging Stations/EVSE

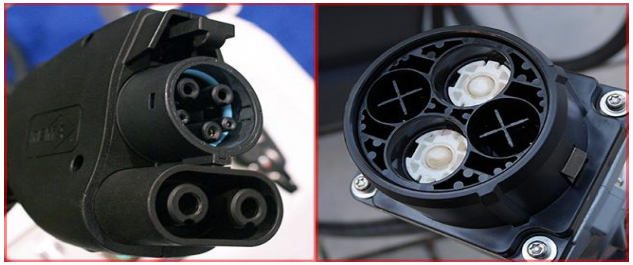
Level 1

DC fast charging EVSE


greencarreports.com


Hardwired or portable Level 2 EVSE

edn.com



CCS CHAdeMO

kootenayevfamily.ca

Standard J1772 connector /plug

Different connectors/ plugs

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# Electric vehicle charging levels/types

| | Level 1 | Level 2 | DC Fast Charging |
|---|---|---|---|
| **Circuit** | Standard outlet 120 V, 15-20 A | Dedicated circuit 240 V, 30-40 A | Dedicated circuit 480 V, 125 A |
| **EVSE** | Regular GFI outlet, available everywhere | Charging station (electrician) | Charging station (electrician) |
| **Cord set** | Included with car, 3 prong w/ J1772 | After-market, cord w/ J1772 | After-market, multiple standards |
| **Power** | 1.44 kW | 3.3-6.6 kW | 50 kW |
| **Time** | 12-24 hours | 4-8 hours | 30 minutes |
| **Charge time** | 3 to 5 miles per hour charge | 10 to 25 miles per hour charge | 200 miles per hour charge |
| **Cost** | None | $1.5k-$5k + install | $10k-$30k + install |
| **Best for…** | LSEVs PHEVs <20 mile | BEVs PHEVs >20 mile | Fast Charge BEVs PHEVs >20 mile |

Bentley Energy Consul

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# Common Charge Times

| | Level 2 - 7.7 kW EVSE | |
|---|---|---|
| **Model** | **Miles/ Charge-Hour** | **Full Charge Time** |
| Tesla Model 3 (BEV) | 25 | 6.5 |
| Tesla Model S (BEV) | 25 | 8 |
| Tesla Model X (BEV) | 25 | 8 |
| Chevrolet Bolt EV (BEV) | 24 | 8.5 |
| Nissan LEAF (BEV) | 22 | 6 |
| BMW 530e | 12 | 2.5 |
| Toyota Prius Prime | 11 | 2.5 |
| Chevrolet Volt | 11 | 4 |
| Ford Fusion Energi | 11 | 2 |

(@30-60 min w/Tesla L3DC super charger)

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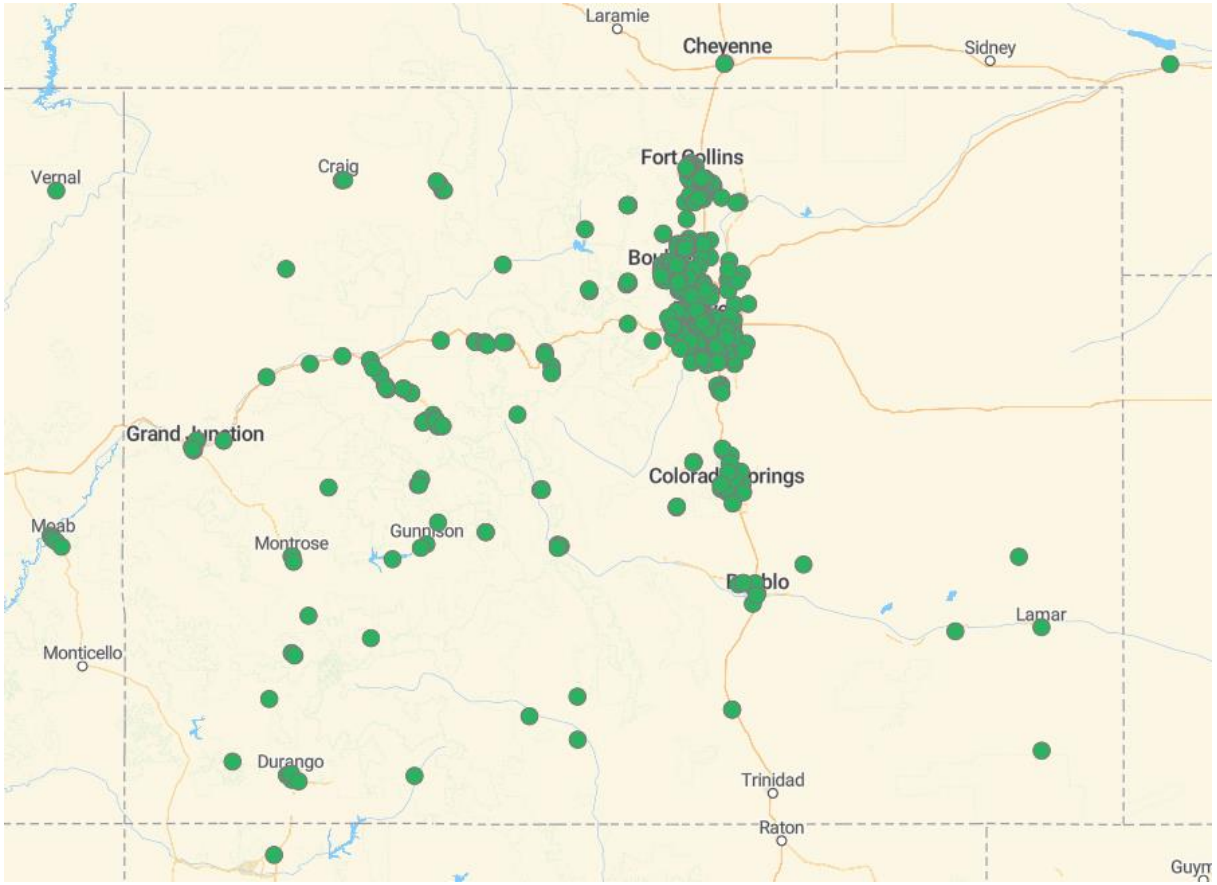
# Public Level 2 Charging Stations

~800 stations; ~2,200 outlets




Source: https://afdc.energy.gov/stations/#/find/nearest?ev_levels=dc_fast&ev_connectors=NEMA1450&ev_connectors=NEMA515&ev_connectors=NEMA520&ev_connectors=J1772&ev_connectors=TESLA

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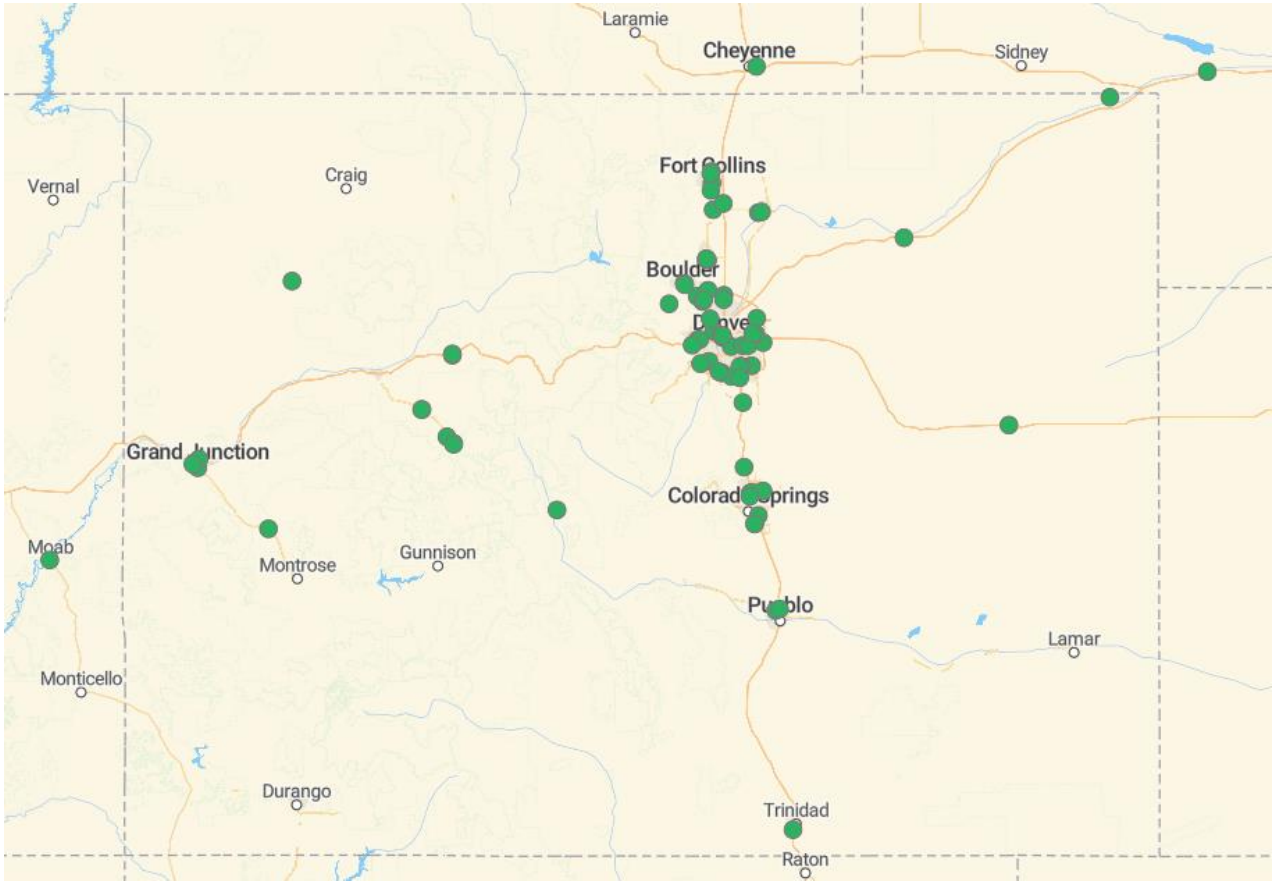
# Public DC CCS/CHAdeMo Charging Stations




Source:
https://afdc.energy.gov/stations/#/find/nearest?ev_levels=dc_fast&ev_connectors=NEMA1450&ev_connectors=NEMA515&ev_connectors=NEMA520&ev_connectors=J1772&ev_connectors=TESLA

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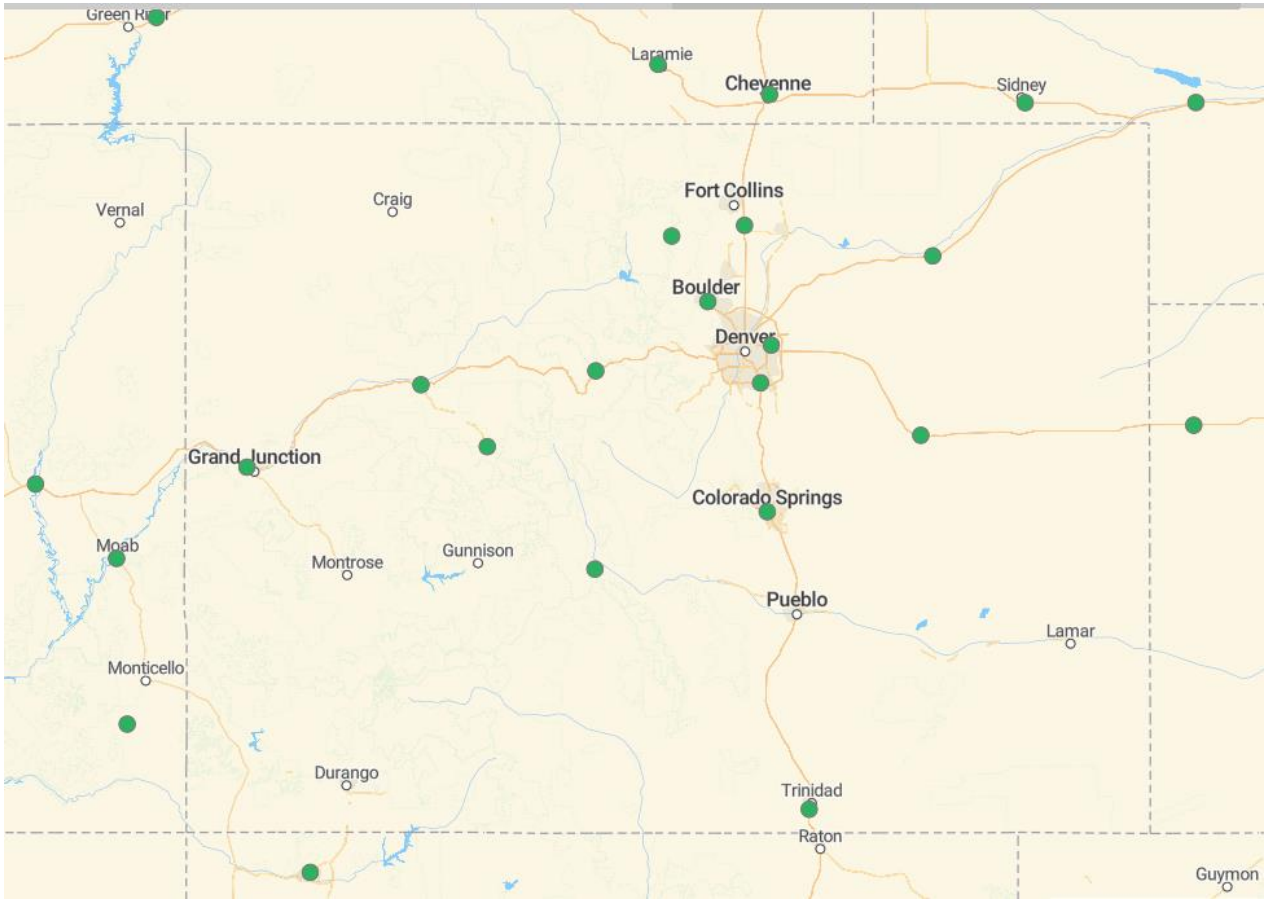
# Public DC Tesla Charging Stations




Source:
https://afdc.energy.gov/stations/#/find/nearest?ev_levels=dc_fast&ev_connectors=NEMA1450&ev_connectors=NEMA515&ev_connectors=NEMA520&ev_connectors=J1772&ev_connectors=TESLA

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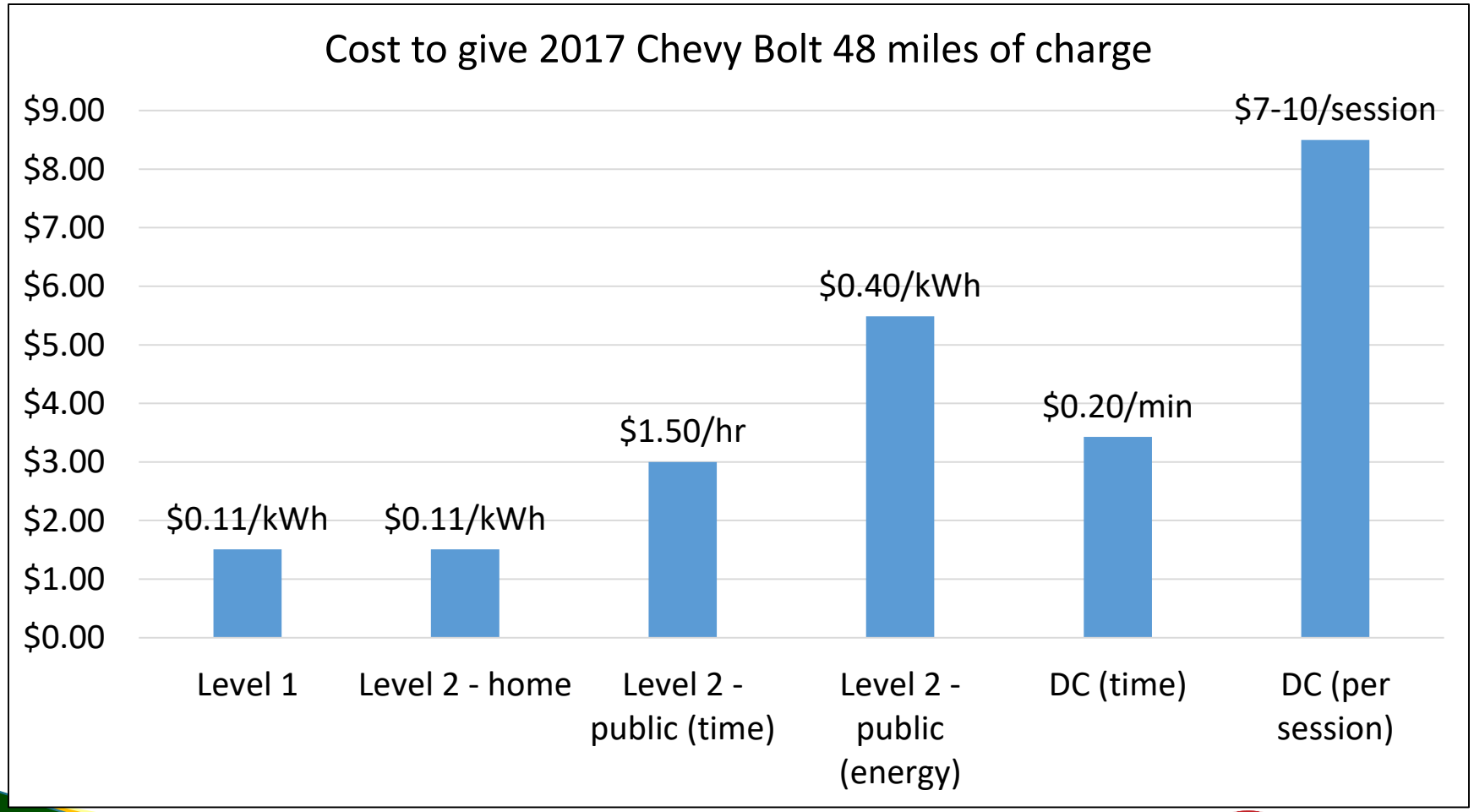
# Sample Charging Costs

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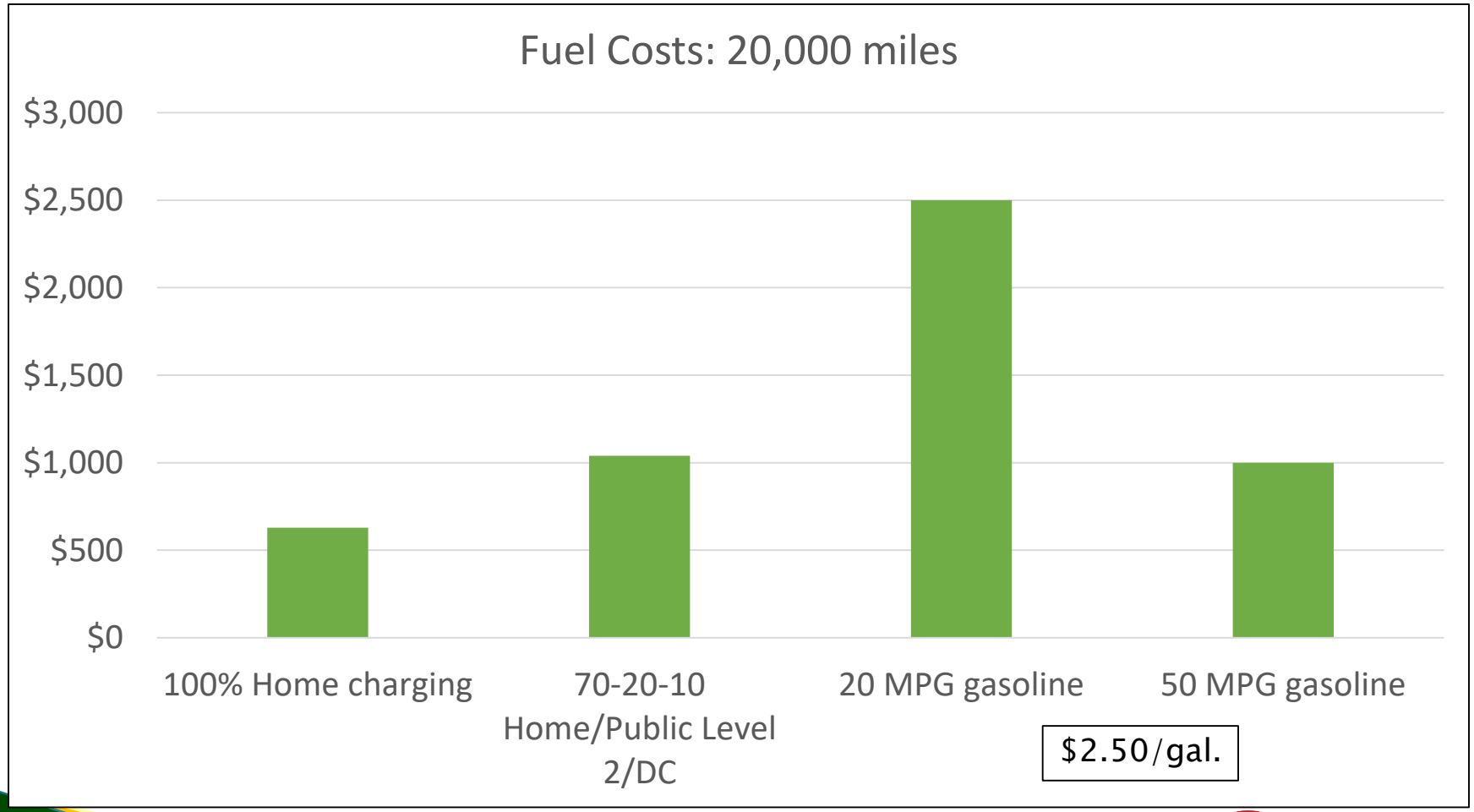
# Electric vs. Gas Fuel

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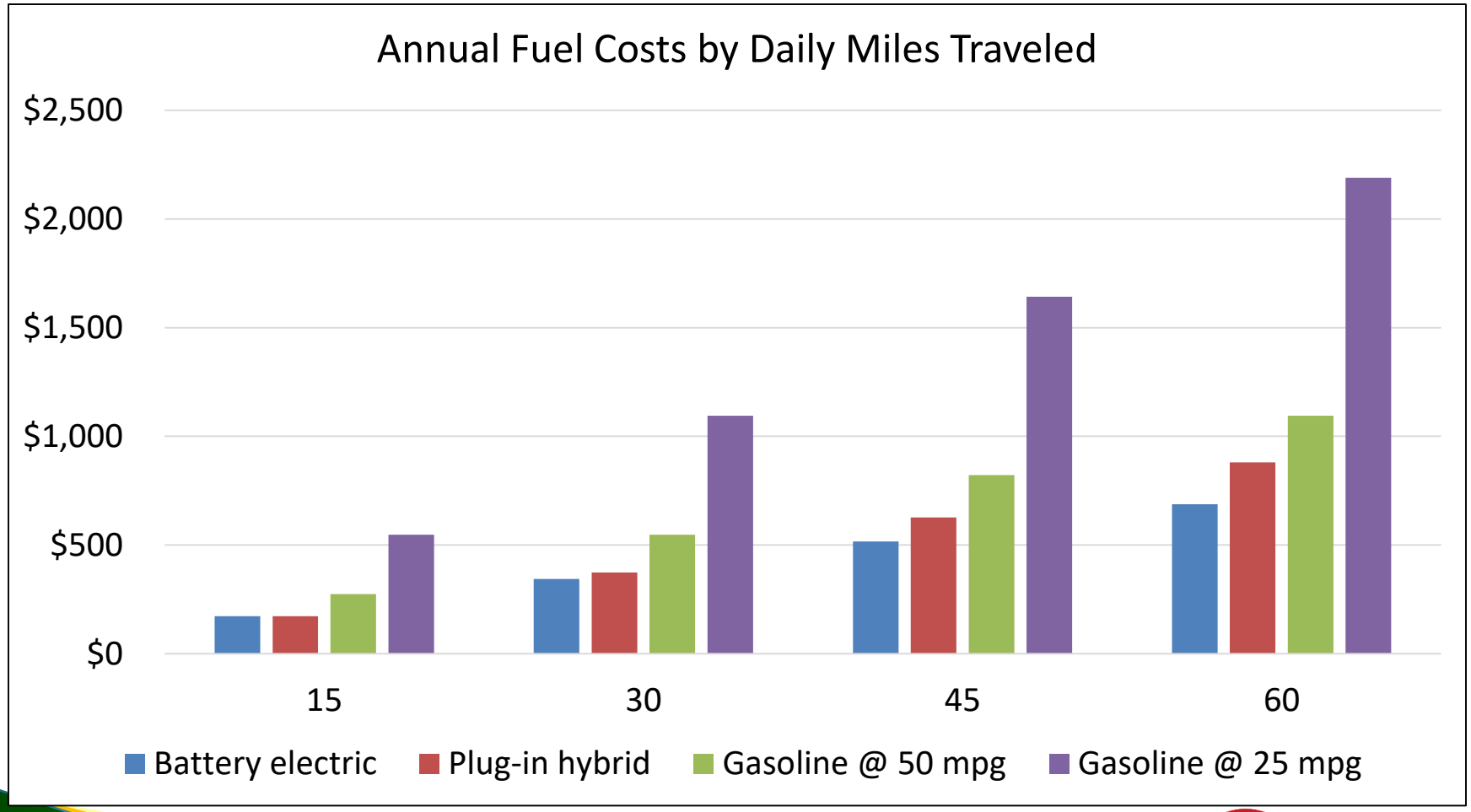
# Electric vs. Gas 2




@ $0.11/kWh and $2.50/gal.

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# How to Pay for a Charge

- Pay-as-you-go service
- Monthly subscriptions
- Tesla Superchargers: $0.28 per kWh
- Based on consumption or time

Payment plans

- Credit card
- Dedicated credit card
- App
- Credit account

Payment methods

# O&M

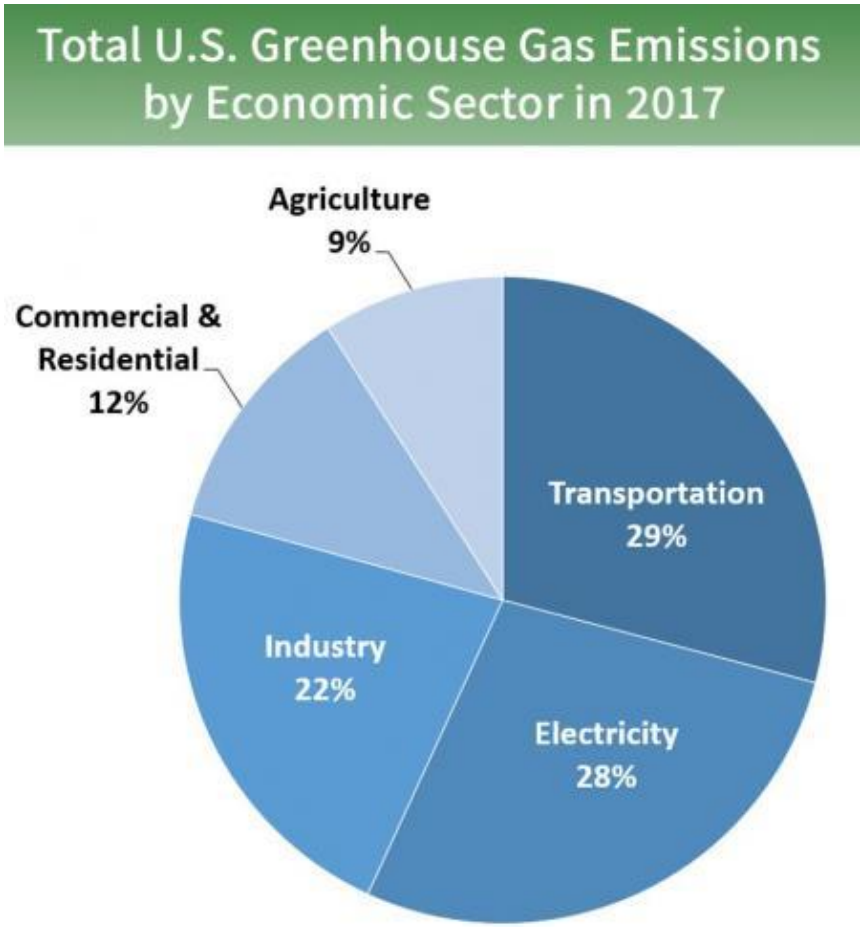
- No timing belts, water pumps, radiators, fuel injectors, motor oil, or transmission fluid
- Regenerative braking
- Battery warranties often 8 year/100,000 mile
- Poor resale values

BEV

- Similar to ICE vehicle but greater intervals between some maintenance items
- Regenerative braking
- Battery warranties often 8 year/100,000 mile

PHEV

# Environmental Benefits (aside from air quality)




Source: https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

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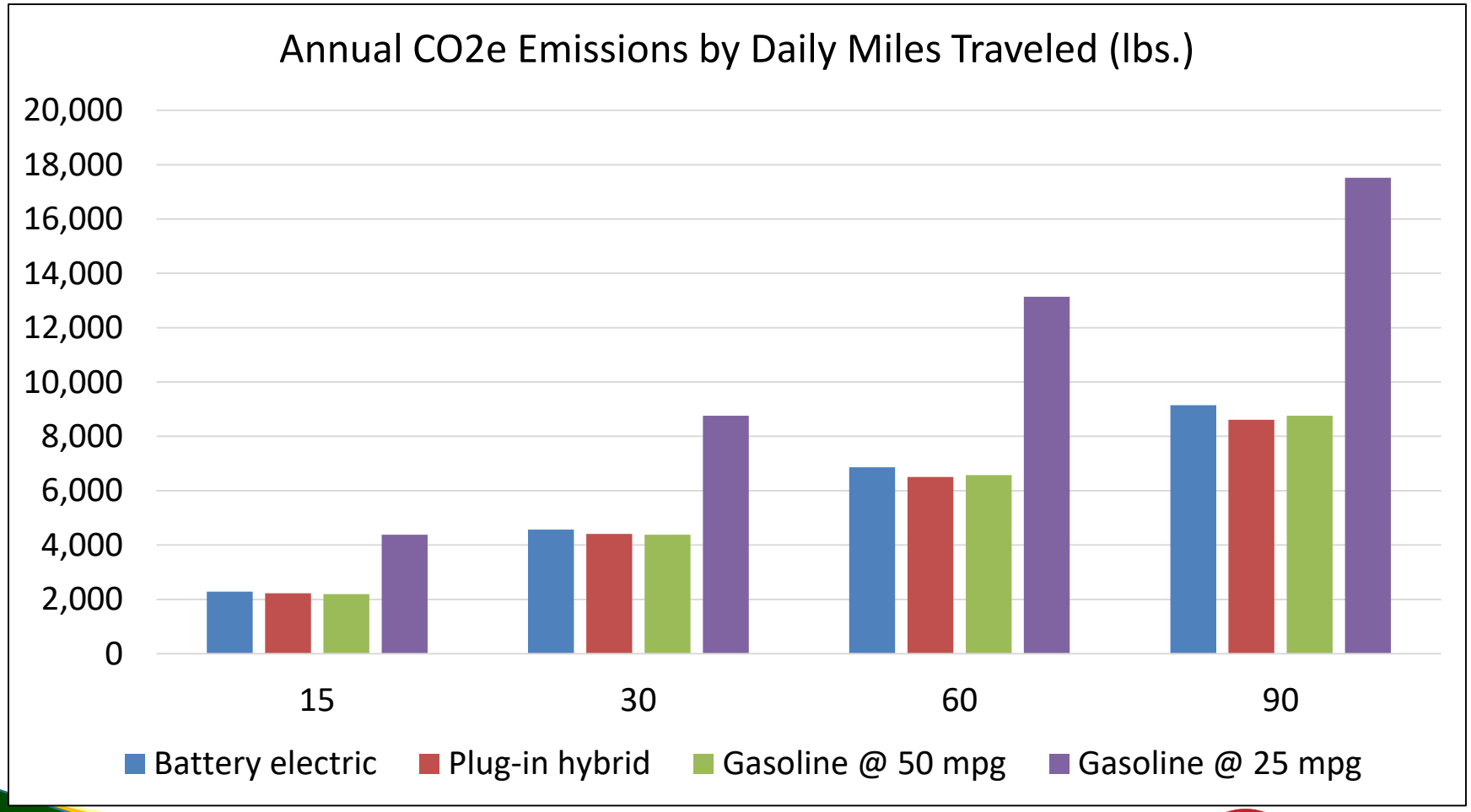
# Emissions @ Current Emissions Rate




1.45 lbs./kWh for CO

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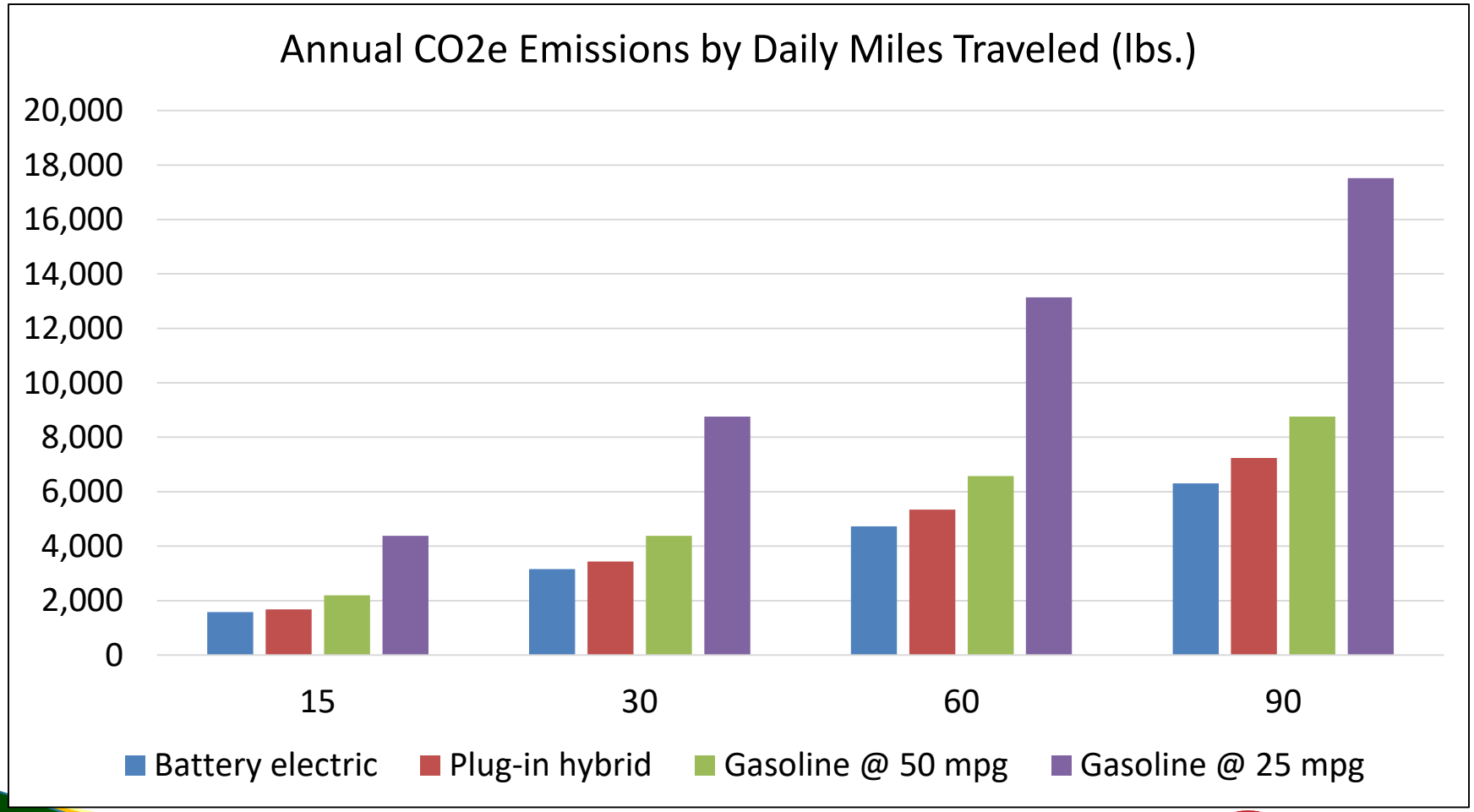
# Emissions @ U.S. Emissions Rate




1 lb./kWh

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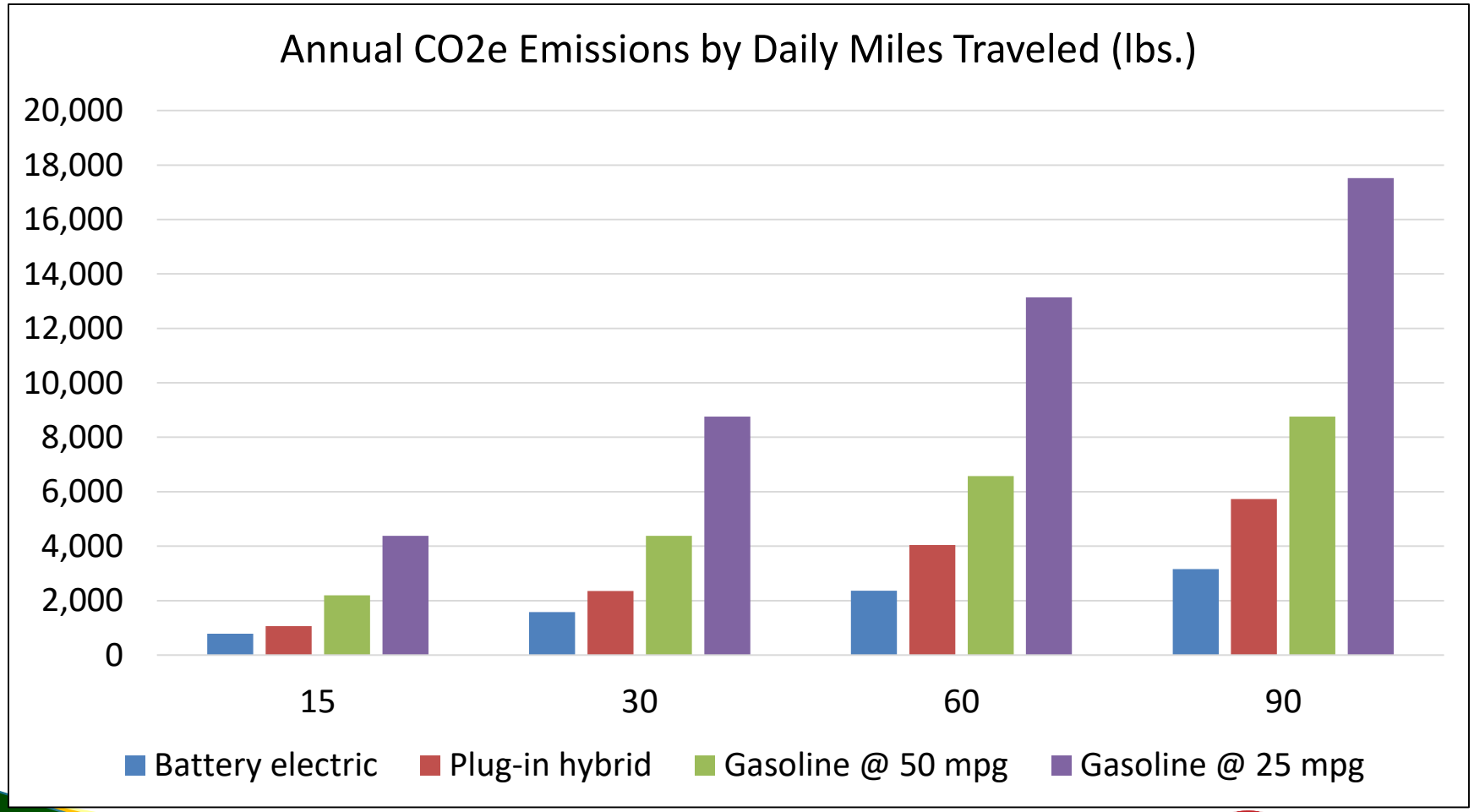
# Emissions @ CA Emissions Rate




0.5 lbs./kWh

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# Going Further

- General: pluginamerica.org
- EV shopping: plugstar.zappyride.com
- Tax credits: fueleconomy.gov/feg/taxevb.shtml
- Home EVSE comparison: chargehub.com/en/home-charging-station-comparison.html
- EV station locator: afdc.energy.gov/fuels/electricity.html

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CSU Extension Director/AC
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http://yourenergy.colostate.edu

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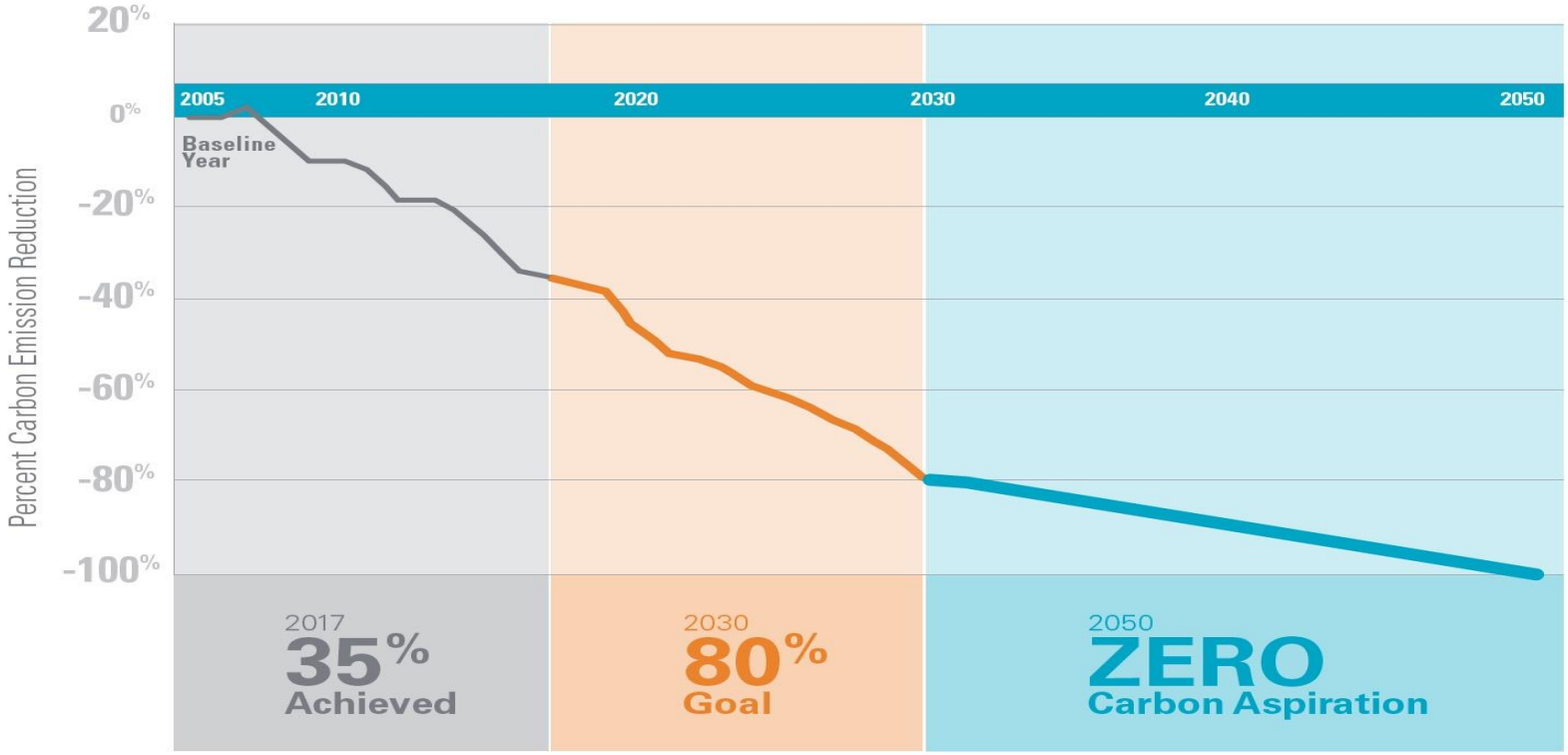
# Electric Vehicle 101

## City of Centennial

# Xcel Energy

# The Clean Energy Transition

## A bold, new vision for 2030 and 2050

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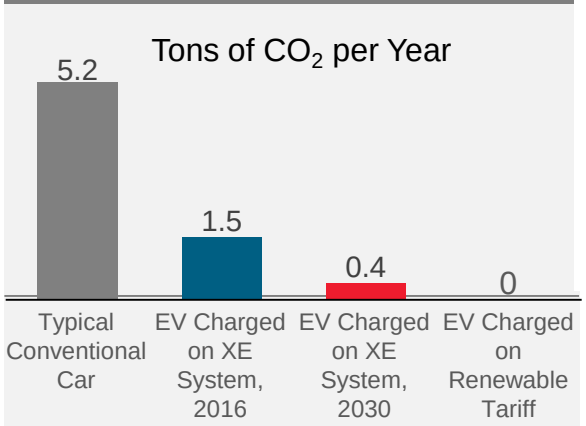
# Customer-focused approach

## Lead the Clean Energy Transition

### Significant Emission Reductions




## Enhance the Customer Experience

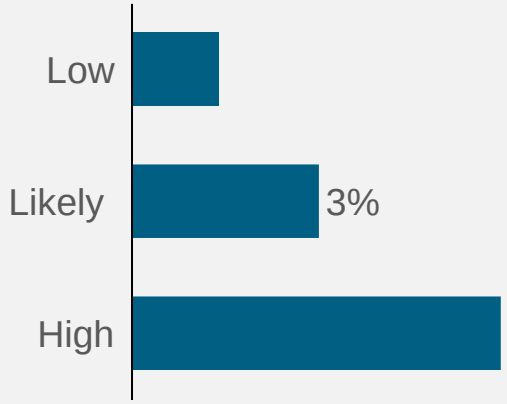
### Customer barriers the Utility


- **Long charging times**
- **Suboptimal incentives to charge when energy costs are lowest**

## Keep Bills Low

### Lower rates through increased sales

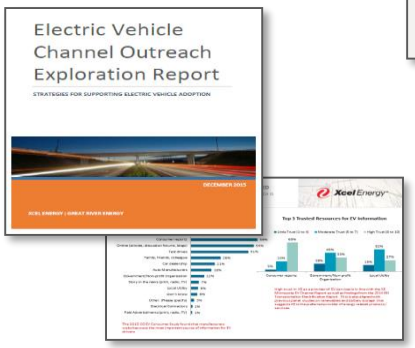
**Share of Load by 2030 by EV Adoption Scenario**




**Source:** Xcel Energy Analysis – Estimated combined emissions for Xcel Energy Minnesota

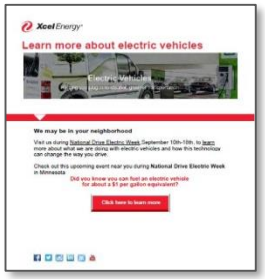
# Xcel Energy's Electric Vehicle Advisory Platform

## Supporting customers wanting to drive with clean, affordable electricity




- Market Research
- Program Measurement


- Brochures
- Web and digital tools




- Email campaigns

- Social media


- Auto Dealers
- Electricians

- Community events
- EV partner events

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# Electric Vehicles

## Electric Vehicle Advisor

Find the EV models that best fit your lifestyle and use our calculator to estimate potential savings and environmental benefits.

Which EV is right for me?

### Understanding Your Electric Vehicle

Learn the basics and benefits of having an electric vehicle.

### Charging Your Electric Vehicle

Learn about charging and pricing options for plugging in at home and on the go.

### Providing Electric Vehicle Charging

Building owners, multifamily managers, and communities have resources to help plan for

Colorado | Customer Support | My Account

Xcel Energy | Billing & Payment | Start, Stop, Transfer | Programs & Rebates | Outage & Emergencies

Home / Energy Portfolio / Innovation / Electric Vehicles / EV Quiz Results

# You have 4 matches!

Based on your answers, we matched you with cars that offer:

- a sporty, responsive performance
- an affordable base price
- good range per charge

Browse all my matches

Retake the Quiz

83 Excellent Match

2019 Tesla Model 3

80 Great Match

2019 Chevrolet Bolt

67 Good Match

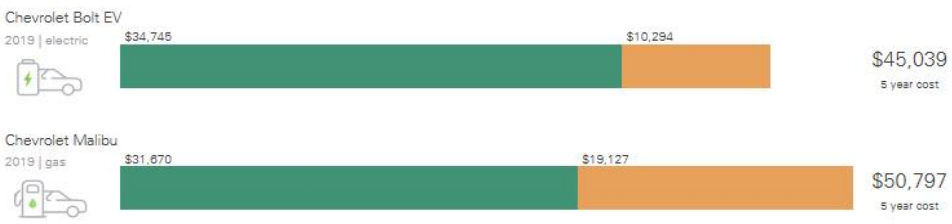
2019 Nissan LEAF

## Cost of Ownership Calculator

Select an EV from the dropdown and view your costs over time.

Discover how much you could save by switching to an EV.

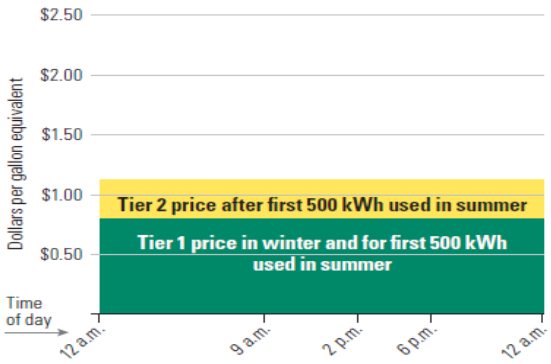
See how much you can save over **5 years** with a **Chevrolet Bolt EV**



# Colorado residential customer pricing plans

## Standard

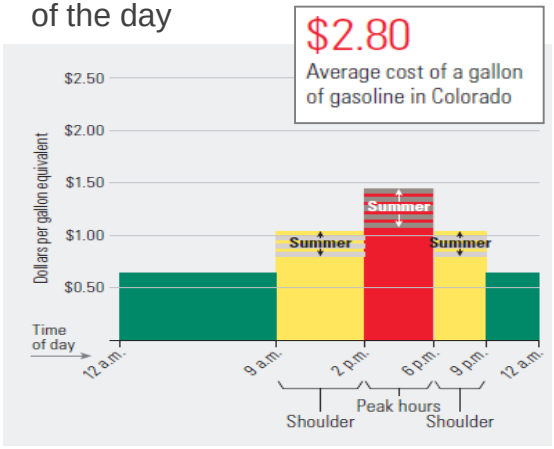
- Provides flexibility to charge anytime with the same price during the day and at night




- **Winter** prices = 9 cents/kWh
- **Tier 1** summer prices = 9 cents/kWh
- **Tier 2** summer prices = 14 cents/kWh

## Time of Use

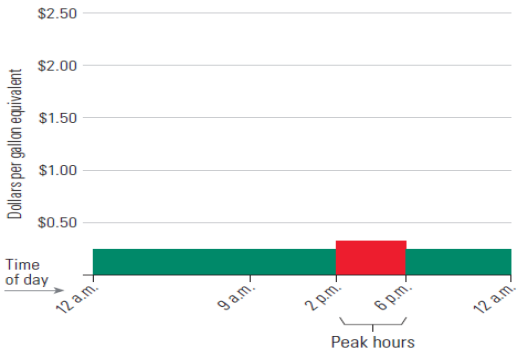
- Customer pays differing prices depending on the amount of energy used during different times of the day




- **On-peak** prices are 14 cents/kWh (winter), 18 cents/kWh (summer)
- **Shoulder** prices are 10 cents/kWh (winter), 13 cents/kWh (summer)
- **Off-peak** prices are 8 cents/kWh (both)

## Peak Demand

- Customer pays demand charge, a peak demand charge, and a charge for the amount of energy used




- Low per-kWh prices since energy bill includes higher demand-based charges during peak hours.
- **On-peak** energy prices are 4 cents/kWh (9am-9pm)
- **Off-peak** energy prices are 3 cents/kWh (9am-9pm)

# Top reasons to drive electric

1. Cost Savings
   - ✓ Driving electric ~$1 per gallon of gasoline
   - ✓ Reduced maintenance
   - ✓ Off-peak charging
2. Environmental Benefits
   - ✓ Clean air/reduced emissions
   - ✓ Xcel Energy carbon free by 2050
3. Fun to Drive
   - ✓ Powerful acceleration
   - ✓ Precise handling

# Learn more by…

**Check out our website and take the EV Advisor**
www.xcelenergy.com/EV

**Contact our team**
ElectricVehicles@xcelenergy.com

**Come take a test drive – be on the lookout for our test drive events**

**Visit an auto dealership – we can point you in the right direction**

# Wrap-up

Xcel Energy®
PARTNERS IN ENERGY
An Xcel Energy Community Collaboration

- Grab some energy materials
- Mix and mingle with other EV enthusiasts and curious consumers
- Check out the EVs outside
- Complete the exit survey

We'll post the presentation and materials to www.Centennialco.gov/energy

Centennial